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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Guillaume Roberge

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AIR LIQUIDE

Intellectual Property

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EXAMINER

YANCHUK, STEPHEN J

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/568,721	Applicant(s) ROBERGE ET AL.	
	Examiner STEPHEN YANCHUK	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 July 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 15-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 15-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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**DEVICE FOR THE TRANSFER OF WATER AND HEAT BETWEEN TWO AIR FLOWS
AND USE THEREOF FOR THE HUMIDIFICATION OF FUEL CELL INLET GAS**

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 28 provides for the use of the device, but, since the claim does not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claim 28 is rejected under 35 U.S.C. 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process, i.e., results in a claim which is not a proper process claim under 35 U.S.C. 101. See for example *Ex parte Dunki*, 153 USPQ 678 (Bd.App. 1967) and *Clinical Products, Ltd. v. Brenner*, 255 F. Supp. 131, 149 USPQ 475 (D.D.C. 1966).

3. The term "long" in claim 17 is a relative term which renders the claim indefinite. The term "long" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The examiner has interpreted "long" to mean "fiber".

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 15-18 and 23-27 rejected under 35 U.S.C. 102(b) as being anticipated by Goel (PGPUB 2004/0115489).

Claims 15 and 16 are rejected by Goel teaching a transport of water in a fuel cell system between a first gaseous stream and a second gaseous stream [Abstract]. The membrane has a hydrophilicity of 10wt% [Abstract]. The less humid side gains heat from the more humid side as it passes to the inlet of the cathode [Paragraph 94, Figure 1]. The more humid side comes from the exhaust of the cathode and transfers heat to the less humid side [Paragraph 94, Figure 1]. There exists two layers that are in contact with each other as the membrane between the two gas streams, a “non-porous dense upper layer” and a “micro porous lower layer” [Paragraph 62]. The non-porous dense upper layer is taught to have a packing density of 49.87% [Example 1].

Claim 17 is rejected by the teaching of the fiber length being at least 210mm [Example 1].

Claim 18 is rejected by the teaching of the "non-porous layer" being formed of glassy polymers [Paragraph 54].

Claim 23 is rejected by the total thickness of the layers being between 20µm-300µm [Paragraph 62].

Claim 24 is rejected by the teaching of the two layers being in contact with each other [Paragraph 62].

Claim 25 is rejected by the teaching that each of the layers can be made with polycarbonates [Paragraph 54].

Claim 26 is rejected by the teaching of a housing that is sealed as required [Paragraph 70]. One in the field would recognize that the sealing could be hermetically sealed by known methods in the art.

Claim 27 is rejected by Figure 1 depicting the membrane located between the two gas flow channels wherein the system has a "DC ELECTRICITY TO INVERTER" section and +/- symbolizing circuitry [Paragraph 75].

3. Claims 15-17, 19, 21-24, and 27 rejected under 35 U.S.C. 102(b) as being anticipated by Schmidt (USPAT 6,783,882).

Claims 15 and 16 are rejected by Schmidt teaching a breathable hydrophobic membrane air filter. It is taught that the apparatus can be used to raise the temperature of fresh air to produce humidified air [Col 7 Ln 65- Col 8 Ln 46]. Figure 2 shows two transfer subassemblies (200, 228) wherein a lamellar, hydrophobic, porous material is arranged between the two structures [Col 4 Ln 35 - Col 5 Ln 25]. Figure 1 depicts that

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the membrane exists between a water reservoir containing the outflow exhaust gas and the inlet flow gas wherein the water reservoir and outflow exhaust gas humidify the inlet gas flow and the membrane exists between them. The membrane is taught to comprise a gas permeable hydrophobic micro porous polymer film laminated with a woven polymer [Col 5 Ln 3-Ln 25].

Claim 17 and 19 are rejected by the teaching of woven polymers being used as the macro porous layer wherein the woven polymer must have a length in order to be woven and that length can be considered "long" [Col 5 Ln 3-Ln 25].

Claim 21 is rejected by the teaching of the micro porous membrane having a pore size from about $.2\mu\text{m}$ - $1.5\mu\text{m}$ which is less than $5\mu\text{m}$ [Col 5 Ln 24].

Claim 22 is rejected by the teaching of the membrane being made of polyethersulfone [Col 5 Ln 8].

Claim 23 is rejected by the teaching of the laminated material and membrane being 5-10mils thick [Col 5 Ln 13] wherein 1mils= $.0254\text{mm}$ therefore the prior art teaches a thickness of $.127\text{mm}$ - $.254\text{mm}$.

Claim 24 is rejected by the teaching of the membrane being laminated and therefore in local contact with each other [Col 5 Ln 10].

Claim 27 is rejected by element 116 of Figure 1 which depicts a circuitry and the depiction of element 228 between the inlet air and the humidifying gas/water.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. **Claims 15-17, 19, 21, 23, 24, & 27 rejected under 35 U.S.C. 103(a) as being unpatentable over Hartnack et al (PGPUB 2004/0234833) and Schmidt (USPAT 6,783,882).**

Claim 15 and 16 are rejected by Hartnack teaching a humidification cell comprising a water-permeable membrane located between two external plates [Abstract]. The plates split up two areas, an operating gas space and a humidification water space, wherein heat is transferred from the humidification water space to the operating gas space [Paragraph 8]. A support layer (7a, Figure 3) is constructed of a hydrophilic carbon paper [Paragraph 40]. Hartnack teaches the humidification of inlet gas (arrows pointing to the west of the page) by exhaust gas (arrows pointing to the east of the page) by a flow of fluid from the side of element 7a [Figure 2], but Hartnack fails to teach the particulars of the membrane layer.

Schmidt teaches a breathable hydrophobic membrane air filter. It is taught that the apparatus can be used to raise the temperature of fresh air to produce humidified air [Col 7 Ln 65- Col 8 Ln 46]. Figure 2 shows two transfer subassemblies (200, 228) wherein a lamellar, hydrophobic, porous material is arranged between the two structures [Col 4 Ln 35 - Col 5 Ln 25]. Figure 1 depicts that the membrane exists

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between a water reservoir containing the outflow exhaust gas and the inlet flow gas wherein the water reservoir and outflow exhaust gas humidify the inlet gas flow and the membrane exists between them. The membrane is taught to comprise a gas permeable hydrophobic micro porous polymer film laminated with a woven polymer [Col 5 Ln 3-Ln 25]. One of ordinary skill in the art would have known to combine the membrane of Schmidt in place of the membrane of Hartnack because Schmidt teaches the motivation for the device to produce humidified air to the cathode of the fuel cell [Col 7 Ln 65- Col 8 Ln 4].

Claim 17 and 19 are rejected by the teaching of woven polymers being used as the macro porous layer wherein the woven polymer must have a length in order to be woven and that length can be considered "long" [Col 5 Ln 3-Ln 25].

Claim 21 is rejected by the teaching of the micro porous membrane having a pore size from about .2 μ m-1.5 μ m which is less than 5 μ m [Col 5 Ln 24].

Claim 23 is rejected by the teaching of of the laminated material and membrane being 5-10mils thick [Col 5 Ln 13] wherein 1mils=.0254mm therefore the prior art teaches a thickness of .127mm-.254mm.

Claim 24 is rejected by the teaching of the membrane being laminated and therefore in local contact with each other [Col 5 Ln 10].

Claim 27 is rejected by element 116 of Figure 1 which depicts a circuitry and the depiction of element 228 between the inlet air and the humidifying gas/water.

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6. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schmidt (USPAT 6,783,882) in view of claim 17 above, and Nuttall et al. (PGPUB 2005/0112430).

Schmidt teaches the device for transferring water and heat, as well as the tailorability of the pore size to match the amount of water needed for the humidification of the gas stream [Col6 Ln 43-67], but fails to teach the pore size of the layers being between 50-250 μ m.

Nuttall teaches a hydrophilic porous material having a pore size of .1-100 μ m [Paragraph 10]. It would have been obvious to one of ordinary skill in the art to use Nuttall's membrane because he teaches a way to overcome condensing heat exchangers that utilizes a humidifying method [Paragraph 10] which is important for conserving water recovery and energy efficiency [Paragraph 8].

Response to Arguments

1. Applicant's arguments filed 7/23/2009 have been fully considered but they are not persuasive. The interpretation the examiner has taken toward the claims do not coincide with that of the applicant wherein the applicant argues that his claims are narrower than represented.

2. The 112 rejects still stand since a new form of the claims was not submitted wherein the claims are indicated as changed and/or canceled.

3. The argument regarding the term hydrophilicity in the claim is not found persuasive. Hydrophobic and hydrophilic are relative terms used to determine the

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wetability of a material compared to another material. In the math of it, every material has a degree of hydrophilicity and hydrophobicity. It is the examiners position that the applicant must either define the degree of this quality through calculated values or through material structure that limits the device. Taking into account the dependant claims wherein the material makeup of the device is taught would be enough to overcome this terminology in the independent claim.

4. The argument regarding the first and second air flows being separated by a transfer assembly is not persuasive. The applicant has not structurally defined a device that has two inlets and two outlets wherein the two flow channels are separated by a transfer assembly. The examiner has interpreted a first air flow to include an air flow at an inlet and a second airflow existing at the outlet wherein the inlet and outlet have a separator between them.

5. The argument regarding porosity is found non-persuasive. Goel teaches a membrane that uptakes moisture from a more moist flow to a less moist flow of two gaseous streams. In order to transfer moisture, the membrane must have a porosity. The applicant arguing "macroporous" and "microporous" is to be notified that this definition alone does not overcome something that has a pore size of 1nm wherein $1\text{nm}=0.001\text{micrometer}=10^{-9}\text{m}$; this is used as an example to show that something is "non-porous" that is a transfer assembly is therefore not a hermetic material and therefore must have a porosity and regardless of that porosity, it will have some scale to micro or macro. The applicant clarified the scales of micro and macro in the dependant claims of claim 20 but failed to comment on this combination in a constructive manner.

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6. The applicant's argument regarding the combination being invalid is found non-persuasive; the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). The two references teach using a membrane to separate liquids and therefore one of ordinary skill in the art would know to look at these materials for solutions.

7. The applicant's argument regarding the airtight film on the periphery of the stack is not found persuasive wherein one of ordinary skill in the art would have viewed the casing that encases the flows and membrane's to be such that the contents do not leak out. No further reference is needed to show this teaching.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to STEPHEN YANCHUK whose telephone number is (571)270-7343. The examiner can normally be reached on Monday through Thursday 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/STEPHEN YANCHUK/
Examiner, Art Unit 1795

/PATRICK RYAN/
Supervisory Patent Examiner, Art Unit 1795